

Tuberculosis Case-Finding Survey Program Of the Veterans Administration

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Taking routine chest X-rays of patients admitted to hospitals has been strongly advocated by the National Tuberculosis Association, the American Hospital Association, and the United States Public Health Service as a practicable and useful procedure. However, despite all the efforts by the national and State agencies concerned with medical care, public health, and hospital administration, limited progress has been made up to the present time in the development of a tuberculosis case-finding program in general hospitals. Only a small fraction of the general hospitals in the United States are reported to have a program in operation (1, 2).

Tuberculosis acquired by hospital personnel is usually considered an occupational disease and is therefore a financial liability of the hospital. Like any other large industry, hospitals must protect their employees from occupational hazards. When the relatively small cost of routine radiography of patients on admission to hospitals and a thorough case-finding program for personnel is compared to the expenses incurred by lost earnings, medical care, and compensation, failure to take proper steps in

prevention of "occupational tuberculosis" is incomprehensible. Nevertheless, it appears that the slow progress of general hospitals in undertaking such a program has been principally ascribed to financial considerations.

The importance of chest X-ray surveys becomes increasingly evident when one considers that in approximately one-half of all cases in which pathology is discovered by X-ray, no correlation can be established between the significant tuberculous lesions detected on the roentgenograms and any existing clinical symptoms or physical findings. Apparently, X-ray detects early structural tissue changes when clinical symptoms and physical findings are negligible or absent. Successful treatment is naturally more assured in cases diagnosed before destruction of lung tissue has taken place.

The effectiveness of a tuberculosis case-finding program has been adequately demonstrated by various reports published during the past 10 years (3, 4, 5, 6). Still, the program has been viewed with reservations by some hospital administrators, possibly because of the fact that, in the main, the findings have been based upon surveys of relatively small groups of inpatients. Our purpose in this paper is to report the results of the Veterans Administration tuberculosis case-finding program extending over a period of 18 months—from October 1, 1949, to April 1, 1951—and based upon over one million chest X-rays. As a guide to those contemplating the initiation of a similar program, we have also outlined the general procedures currently in operation in all Veterans Administration medical installations.

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The Program

The Veterans Administration tuberculosis case-finding survey program began in August 1945. It was fully implemented on a broad scale, with complete reporting in September 1949. This program, particularly as it relates to the screening of in-patients, has proved to be the most effective of the several control measures adopted by the Tuberculosis Division for the protection of patients and personnel.

The program, in brief, is this:

1. In-patients and out-patients:

(a) A chest X-ray is obtained for each hospitalized veteran at the time of admission and for each out-patient at the time of scheduled examination if none has been made within 6 months. Thus, any veteran who comes for treatment or examination will get a chest X-ray if he has not had one within 6 months.

(b) Periodic chest X-rays are taken of all chronic general and neuropsychiatric in-patients every 12 months.

2. Personnel:

(a) All employees in regional offices and hospitals are given chest X-rays at the time of employment and when transferred to another installation or separated from employment. At 6- or 12-month intervals, employees are re-examined roentgenographically. In addition, hospital employees are given a tuberculin test (Mantoux) at the time of employment.

(b) For tuberculosis-control purposes, hospital employees are divided into two general groups: (1) those who are *not* regularly exposed to tuberculosis patients or contaminated materials, (2) those who are regularly exposed. Negative reactors to tuberculin among employees in group 1 receive Mantoux tests at intervals of not more than 6 months and chest X-rays at intervals of not more than 12 months. Should an employee in this group show sensitivity following a prior negative reaction, he is immediately given a chest X-ray; roentgenograms are repeated at 3-month intervals over a period of 18 months; and chest X-rays are scheduled at 12-month intervals.

For nonreactors among group 2 employees, tuberculin tests are repeated every 3 months

while the employee remains in this group. Should the test become positive following a prior negative reaction, the employee is immediately given a chest X-ray; X-rays of the chest are then taken every 3 months over an 18-month period, after which time routine X-rays at 6-month intervals are made.

3. Follow-up and reporting procedures:

(a) Photofluorography with 35-mm. or 70-mm. roll films, or 4 x 5 inch single films is used for screening purposes. Cases with suspicious chest pathology are immediately followed up with another X-ray on a 14 x 17 inch film and by careful laboratory and clinical studies. When the follow-up examination revises the initial findings, a corrected report is prepared.

(b) X-ray findings of active, inactive, and suspected tuberculosis or pleurisy are reported on a specially designed VA Form 10-2861. Positive and negative findings are tallied by each reporting installation, and a summary report, VA Form 10-7384, together with individual case reports, is submitted quarterly for review, tabulation, and analysis by the tuberculosis control section.

(c) Instructions covering the tuberculosis case-finding survey program provide specifically that no person will be admitted to the survey group if a tentative or previous diagnosis of tuberculosis had been made. Thus the program is restricted to the detection and reporting of unknown cases.

Findings

The data presented in this paper are not those obtained from the impressions of the "screening" X-ray, but have, in most cases, been verified on the basis of follow-up X-rays, laboratory, and clinical evidence. Furthermore, despite the significant number of cases of other chest pathology, such as bronchogenic carcinoma, lung abscess, bronchiectasis, cystic disease of the lung, and cardiovascular abnormalities, these diseases have not been included in this analysis since they do not enter into a tuberculosis control program. However, in many instances routine chest X-ray detects these other chest conditions at a stage early enough to per-

Table 1. Number of new cases of tuberculosis, by clinical status, found on routine X-ray of Veterans Administration in-patients, out-patients, and personnel, October 1949–March 1951

Category of persons surveyed	Persons surveyed	Clinical status					
		Active		Inactive		Suspected	
		Number	Percent of persons surveyed	Number	Percent of persons surveyed	Number	Percent of persons surveyed
Grand total.....	1, 091, 708	6, 045	0. 55	17, 450	1. 60	7, 729	0. 71
In-patients.....	482, 120	3, 563	. 74	8, 079	1. 68	4, 637	. 96
Veterans of World War II.....	293, 611	1, 850	. 63	2, 967	1. 01	2, 067	. 70
Other veterans.....	188, 509	1, 713	. 91	5, 112	2. 71	2, 570	1. 36
Out-patients.....	404, 040	2, 250	. 56	6, 424	1. 59	2, 436	. 60
Veterans of World War II.....	316, 363	1, 435	. 45	3, 721	1. 18	1, 488	. 47
Other veterans.....	87, 677	815	. 93	2, 703	3. 08	948	1. 08
VA personnel.....	205, 548	232	. 11	2, 947	1. 43	656	. 32
In hospital.....	190, 175	212	. 11	2, 761	1. 45	578	. 30
Tuberculosis hospitals.....	29, 270	37	. 13	641	2. 19	70	. 24
Neuropsychiatric hospitals.....	49, 409	48	. 10	885	1. 79	127	. 26
General medical and surgical hospitals.....	111, 496	127	. 11	1, 235	1. 11	381	. 34
Total in regional office.....	15, 373	20	. 13	186	1. 21	78	. 51

mit a favorable prognosis when delay in diagnosis might have been fatal.

During the 18 months of the tuberculosis case-finding survey, 1,091,708 chest X-rays were taken of patients and employees. Of this group, 6,045, or 0.6 percent, were diagnosed as having active pulmonary tuberculosis. In addition, 17,450 persons, or 1.6 percent, showed lesions which represented inactive tuberculosis, and at the time of report 7,729 individuals, or 0.7 percent, were tentatively classified as having "suspected" tuberculosis. Perhaps a clearer concept of the magnitude of the program and its effective yield, in terms of tuberculosis case finding, might be obtained if these figures are recast to present our experience for a given month. Consider these facts: On the average, over 60,000 persons are being surveyed monthly, and each month we are discovering more than 350 active cases of pulmonary tuberculosis and, in addition, about 1,000 inactive cases.

In table 1 are summarized findings for each of the three major categories of persons surveyed: in-patients, out-patients, and personnel. The highest prevalence of clinically significant tuberculosis was found among the in-patient group (7.4 out of every 1,000 patients surveyed). This yield was approximately 30 per-

cent higher than that found among the out-patients surveyed (5.6 per 1,000), and about seven times that observed among personnel (1.1 per 1,000). However, these over-all comparisons of the discovered cases per unit group X-rayed should be adjudged critically. To forecast the relative yields from routine surveys of in-patients as compared to out-patients, it is necessary to take into account the characteristics of the respective groups with reference to such factors as age, race, sex, and economic status. For example, the detailed findings presented in table 1 disclose that we actually found a significantly higher prevalence of active tuberculosis among older out-patients than among younger in-patients.

In-Patients

Approximately one-half million chest X-rays were taken on veterans in the 98 general hospitals and the 34 neuropsychiatric hospitals operated by the Veterans Administration. It is estimated that 90 percent of the total number surveyed were veterans admitted to these hospitals during the report period, the remainder being the chronic patients, predominantly psychotic, who received periodic chest X-rays.

Evidence of manifest tuberculosis, active and

inactive, was present in 11,642, or 2.42 percent of the 482,120 in-patients; and of these, 3,563, or 0.74 percent, were classified as having active tuberculosis. In addition, 4,637 patients were tentatively diagnosed as "suspected" tuberculosis cases. A sample survey of this suspected group indicated that about 10 percent of them would ultimately be found to have active disease. Thus, it is estimated that approximately 4,000 patients, or 0.8 percent of the total in-patients surveyed, were discovered to have active tuberculosis. This figure is comparable to previously published results of chest X-ray surveys on patients admitted to general hospitals. Bryant (2) recently summarized the findings in six such surveys in which the prevalence of active tuberculosis varied from 0.4 to 1.8 percent. However, as was indicated by Bryant, these data are not strictly comparable because of differences in the methods employed in classifying the patients. In the three studies in which the X-ray findings were verified by clinical and laboratory evidence, the prevalence of unsuspected, active tuberculosis was between 0.4 and 0.6 percent (3, 4, 7). In any case, it seems quite evident that the yield of unsuspected, active tuberculosis from surveying in-patients in general hospitals is at least four times, and probably as much as eight times, as high as that found in surveys of cross sections of the general population, or of large industrial groups.

Marked variation in the prevalence of clinically significant tuberculosis among in-patients in different age groups has been indicated by several investigators (3, 8). It has also been reported that with advancing age, the prevalence of tuberculosis among males was higher than among females. Moreover, Bloch and Tucker (9) found almost twice as much clinically significant tuberculosis among their Negro out-patients as among the white group surveyed. Unfortunately, our current reporting procedures do not permit the analysis of differences in prevalence according to race and sex. Comparisons are possible, however, between two groups of patients which may be considered as representing the variation to be expected with regard to age. We group separately veterans who served during World War II and those who had other periods of military service. Prac-

tically all World War II veterans are under 50 years of age, whereas the "other veterans" group is principally comprised of veterans over 50 years of age. The average age of each group is approximately 32 and 60 years, respectively. The prevalence of active tuberculosis was approximately 45 percent higher among the older in-patients (9.1 per 1,000) than among the younger group (6.3 per 1,000). Moreover, as might be expected, almost three times as much inactive tuberculosis was discovered among the older in-patients (27.1 per 1,000) as among the younger group (10.1 per 1,000). The relatively high yield of both active and inactive tuberculosis among in-patients over 50 years of age is of special significance, in view of the fact that many persons in this group with significant tuberculosis usually do not participate in voluntary community-wide chest surveys (10).

From the data assembled in table 2, it appears that the prevalence of both active and inactive tuberculosis among in-patients surveyed in our general hospitals was slightly higher than that observed among the patients surveyed in our neuropsychiatric hospitals. The lower rate among neuropsychiatric patients is probably related to the fact that the major part of this group is comprised of patients resident in these institutions for many years, who have received periodic chest X-rays. The prevalence of tuberculosis among this group should reasonably be lower than that among current admissions. It is, therefore, not proper to assume that our reported findings represent differences in tuberculosis prevalence between general and neuropsychiatric patients currently being admitted into our hospitals.

It is generally agreed that only about 15 percent of sanatorium patients are admitted with minimal disease, and about 70 percent are admitted with far-advanced disease. In our case-finding experience (table 3) 23 percent of the 3,563 in-patients discovered with active tuberculosis were classified as having minimal disease. Of special significance is the fact that only 37 percent of these in-patients were in the far-advanced stage.

Out-Patients

Over 400,000 out-patients were surveyed during the period covered by this report. Evi-

Table 2. Number of new cases of tuberculosis, by clinical status, found on routine X-ray of Veterans Administration in-patients in general and neuropsychiatric hospitals, October 1949–March 1951

Category of in-patients surveyed	Persons surveyed	Clinical status					
		Active		Inactive		Suspected	
		Number	Percent of persons surveyed	Number	Percent of persons surveyed	Number	Percent of persons surveyed
In-patients.....	482, 120	3, 563	0. 74	8, 079	1. 68	4, 637	0. 96
General medical and surgical hospitals.....	411, 495	3, 113	. 76	7, 104	1. 73	4, 129	1. 00
Neuropsychiatric hospitals.....	70, 625	450	. 64	975	1. 38	508	. 72
World War II veterans.....	293, 611	1, 850	. 63	2, 967	1. 01	2, 067	. 70
General medical and surgical hospitals.....	251, 272	1, 668	. 66	2, 586	1. 03	1, 898	. 76
Neuropsychiatric hospitals.....	42, 339	182	. 43	381	. 90	169	. 40
Other veterans.....	188, 509	1, 713	. 91	5, 112	2. 71	2, 570	1. 36
General medical and surgical hospitals.....	160, 223	1, 445	. 90	4, 518	2. 82	2, 231	1. 39
Neuropsychiatric hospitals.....	28, 286	268	. 95	594	2. 10	339	1. 20

dence of significant tuberculosis, active and inactive, was discovered in 8,674 out-patients, or 2.2 percent of the total group surveyed; and of these, 2,250, or 0.6 percent, were classified as having active tuberculosis. At the time of the report, an additional 2,436 out-patients were tentatively classified as "suspected" cases. When these findings are compared with the Negroes and expectant mothers who comprised the 40,000 out-patients surveyed by Bloch and Tucker, it would appear that these two special groups of out-patients have higher tuberculosis prevalence rates than the veterans treated in our out-patient clinics (9).

The differential observed in prevalence rates among in-patients of different age groups is also found to exist to an even greater degree among the out-patients surveyed. Out-patients over 50 years of age were observed to have a prevalence rate of active tuberculosis almost twice that found among the younger out-patients (9.3 as compared to 4.5 per 1,000); and the yield of inactive tuberculosis among the older group was approximately three times that among the World War II veterans surveyed (30.8 as compared to 11.8 per 1,000).

The distribution of the 2,250 active tuberculosis cases among the out-patients, according to extent of pulmonary involvement, is given in table 3. Only 23.7 percent of the total active

cases were in the far-advanced stage, and in 29.3 percent, the disease was minimal in extent.

Employees

The program of routine chest X-ray examinations of professional as well as nonprofessional personnel employed in Veterans Administration hospitals and regional offices resulted in discovering 232 persons with active pulmonary tuberculosis among the 205,548 persons examined, a prevalence rate slightly higher than 1 per 1,000. Almost 3,000 employees were found to have inactive tuberculosis and were placed under close supervision. In addition, 656 employees were, at the time of report, classified as "suspected" cases.

No significant differences were observed in the prevalence of active tuberculosis among the personnel employed in our regional offices and those employed in our tuberculosis, neuropsychiatric, and general hospitals. However, the prevalence rate of inactive tuberculosis among personnel employed in our tuberculosis hospitals was significantly higher than that observed among employees in our other medical installations. This finding is probably related to the fact that some persons with arrested tuberculosis preferentially seek employment in a tuberculosis hospital, where they find a better understanding of the nature of their disability.

Table 3. Number of new cases of active tuberculosis, by extent of disease, found on routine X-ray of Veterans Administration in-patients, out-patients and personnel, October 1949–March 1951

Category of persons surveyed	Number of active cases	Extent of disease					
		Minimal		Moderately advanced		Far advanced	
		Number	Percent of active cases	Number	Percent of active cases	Number	Percent of active cases
Grand total.....	6, 045	1, 638	27. 1	2, 537	42. 0	1, 870	30. 9
In-patients.....	3, 563	827	23. 2	1, 414	39. 7	1, 322	37. 1
Veterans of World War II.....	1, 850	410	22. 2	747	40. 4	693	37. 5
Other veterans.....	1, 713	417	24. 3	667	38. 9	629	36. 7
Out-patients.....	2, 250	660	29. 3	1, 057	47. 0	533	23. 7
Veterans of World War II.....	1, 435	419	29. 2	689	48. 0	327	22. 8
Other veterans.....	815	241	29. 6	368	45. 2	206	25. 3
VA personnel.....	232	151	65. 1	66	28. 4	15	6. 5
In hospital.....	212	138	65. 1	60	28. 3	14	6. 6
Tuberculosis hospitals.....	37	25	67. 6	9	24. 3	3	8. 1
Neuropsychiatric hospitals.....	48	30	62. 5	12	25. 0	6	12. 5
General medical and surgical hospitals.....	127	83	65. 4	39	30. 7	5	3. 9
In regional offices.....	20	13	65. 0	6	30. 0	1	5. 0

The observed prevalence of active tuberculosis among Veterans Administration personnel (1 per 1,000) is similar to the rate usually reported for adults examined in community-wide and industrial surveys. This finding indicates that the extensive tuberculosis control program currently in operation has probably removed to a considerable extent any special risks attendant upon employment in Veterans Administration medical installations.

Of perhaps greatest significance is the fact that, of the 232 cases of active tuberculosis discovered among VA personnel, 151 (65.1 percent) had minimal lesions, 66 (28.4 percent) were moderately advanced, and only 15 cases (6.5 percent) were far advanced. Inquiry is being made into the circumstances which permitted these 15 employees to escape detection during the period when the disease was in the early stages.

Discussion

On the basis of our experience in initiating and supervising a tuberculosis case-finding survey among in-patients, out-patients, and personnel, it is believed that this program can only be effective when it becomes a permanent proce-

dure and is placed under the direction of a physician designated as the program coordinator, preferably one trained in the treatment of tuberculosis. Unless these steps are taken, hospitals will find it difficult to provide the follow-up work that is needed, and to correlate the efforts of the various departments of the hospital. The survey cannot be considered as a device limited merely to finding a case; the real purpose of the program is to locate all individuals with early tuberculosis and place them under proper supervision and treatment.

A continuous mass survey of a large segment of the general population, such as Veterans Administration beneficiaries, will not only reduce the incidence of tuberculosis in that specific group, but will also affect the morbidity and mortality of the general population through the removal of sources of infection. While our program has been in full operation for only a comparatively short time, the prevalence rates among our surveyed groups already appear to be on the decline. This trend is particularly evident in the decreasing prevalence rates of active tuberculosis among the employees surveyed.

Sixty to eighty million persons in this country annually seek medical care for one or more

complaints, and of these, approximately 16 million enter general hospitals. If it is recognized that the prevalence of tuberculosis among them is significantly higher than among the general population, a routine chest X-ray of these persons may be deemed an essential community health service.

Summary

1. This paper reports the findings of the Veterans Administration tuberculosis case-finding survey program extending over a period of 18 months and based upon over one million chest X-rays. The control measures and reporting procedures constituting this program are also outlined.

2. Six thousand and forty-five persons, or 0.6 percent of the surveyed group, were discovered to have active pulmonary tuberculosis. In addition, 17,450 persons had inactive tuberculosis, and 7,729 individuals were tentatively classified as "suspected tuberculosis" cases.

3. Among the half million in-patients surveyed, approximately 4,000, or 0.8 percent, were found to have active tuberculosis. Of these, 23 percent were classified as having minimal disease; 40 percent, moderately advanced; and only 37 percent, far advanced.

4. On the basis of our experience and that of other investigators, the yield of unsuspected, active tuberculosis among in-patients in general hospitals is at least four times, and probably as much as eight times, that derived from community-wide chest X-ray surveys.

5. The prevalence rate of active tuberculosis among the 400,000 out-patients surveyed was 0.5 percent. Of the out-patients discovered to have active disease, 29 percent had minimal lung involvement; 47 percent were moderately advanced; and only 24 percent were in the far-advanced stage.

6. Among the in-patient and out-patient groups, the prevalence rates of both active and inactive tuberculosis were appreciably higher for veterans 50 years of age and over.

7. Some 200,000 chest X-rays were taken of Veterans Administration employees. The observed prevalence of active tuberculosis in this group (0.1 percent) is similar to the rate usually reported for adults examined in community-wide and industrial surveys. Of the employees discovered with active tuberculosis, 65 percent had minimal lesions; 28 percent, moderately advanced; and only 7 percent, far advanced.

8. In our opinion, this program has proved to be the most effective of the several tuberculosis control measures adopted by the Veterans Administration for the protection of patients and personnel.

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